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Corrigendum

Corrigendum to “Factoring, into edge transpositions of a tree, permutations fixing a terminal vertex” [J. Combin. Theory Ser. A 85 (1) (1999) 92–95]

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The proof of Theorem 9 of [1] contains an error,[1] and the assertion is in fact false, as is shown by the following example. (We use the same symbol for an edge and the associated transposition and multiply from right to left, e.g. $(1,2)(1,3) = (1,3,2)$.) Let the vertices be $\{1,2,3,4,5,6,7,8\}$ and the edges $\{a = (1,4), b_1 = (3,4), b_2 = (2,3), c_1 = (4,5), c_2 = (5,6), c_3 = (6,7), c_4 = (7,8)\}$. Let $\sigma = (1)(2,7)(3,8)(4,6)(5) = ab_1c_1b_2b_1c_2c_1ac_3c_2c_1b_1c_4c_3c_2c_1b_2b_1a = b_1b_2c_1b_1c_2c_1b_1b_2b_1c_3c_2c_1b_1c_4c_3c_2c_1b_2b_1$ (both of length 19).

Since, as a permutation of $\{2,3,4,5,6,7,8\}$ σ has 19 inversions, no product for it involving only b's and c's can have smaller length. A bit of (Mathematica-aided) checking confirms that there is no shorter factorization of σ even allowing a, so the example is consistent with the weaker conjecture that there is always some factorization of minimal length not using the edge, i.e. an affirmative answer to the first part of Question 2 of [2] and with Conjecture 1. The example shows that the answer to the second part of Question 2 is (sometimes) affirmative.

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[1] The argument starts with a counterexample of minimal length and constructs a shorter word also fixing the vertex and containing the edge. However if the shorter word is equivalent to a still shorter word not containing the edge it is not a shorter counterexample and there is no contradiction.

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Incidentally, Conjecture 2 of [2] is false, as is shown by Counterexample 1 of the same paper, introduced there in connection with a different question.

References

[1] J.H. Smith, Factoring, into edge transpositions of a tree, permutations fixing a terminal vertex, J. Combin. Theory Ser. A 85 (1) (1999) 92–95.
[2] T.P. Vaughan, Bounds for the rank of a permutation on a tree, J. Combin. Math. Combin. Comput. 10 (1991) 65–81.